Nautical Almanac; while Mr. Ivory makes it 34′ 17″·5. Again, for the altitude 5° 44′ 21″, we obtain 8′ 49″·5 for the refraction; while the Nautical Almanac gives us 8′ 53″, and Mr. Ivory's table 8′ 49″·6. The author, however, observes that there is no reason for proceeding to compute a new table by this formula, since the method employed for that in the Nautical Almanac is in all common cases more compendious; and even if it were desired to represent Mr. Ivory's table by the approximation there employed, we might obtain the same results, with an error scarcely exceeding a single second, from an equation of the same form.

The Bakerian Lecture. On certain Motions produced in Fluid Conductors when transmitting the Electric Current. By J. F. W. Herschel, *Esq. F.R.S.* Read February 12, 1824. [*Phil. Trans.* 1824, *p.* 162.]

In the first paragraphs of this lecture, Mr. Herschel describes the phenomena that result on placing a portion of mercury covered with sulphuric acid between the voltaic poles immersed on opposite sides of the globule of metal, but in contact with the acid only. They consist in active motion of those particles of the acid in contact with the mercury, while the superficial molecules of the metal continually radiate from the point nearest the negative pole, and darting to the positive pole return along the axis. The author particularly notices several singular appearances resulting from this current, and shows them to be independent of any electro-magnetic vortices, to which, at first sight, they present considerable analogy. They are incomparably more forcible, in proportion to the electric powers used, than the motions produced by the action of magnets; hence, they furnish an extremely sensible test of the development of feeble Voltaic powers not easily rendered sensible by other means.

The author next describes the appearances observed in cases where other liquids and metals are used, and adverts to the influence of several causes upon the uniformity of the results. Among these, impurity in the mercury is especially noticed, which should not only be carefully distilled, but also well washed with dilute nitric acid. Mercury thus prepared, and placed in the current as before, exhibits phenomena varying with the nature of the liquid;—generally speaking, currents are produced radiating from the point nearest the negative pole, which are most violent in acids, and less in saline solutions, in proportion as the electro-positive energy of the base is greater. In many liquids a counter-current from the positive pole is observed; but if either pole be brought in contact with the mercury, no currents are observed from the point of contact, but strong ones are perceived to radiate from the other. If the negative pole touch it, it amalgamates with the mercury, which remains bright; if the positive, the mercury rapidly oxidizes; and in both cases currents are produced.

Mr. Herschel proceeds to observe, that when mercury is electrized

in saline solutions, its properties are generally altered; and he describes at length the phenomena thus presented in a solution of sulphate of soda, which were peculiar and apparently perplexing, but which he found to depend upon the presence of amalgam of sodium counteracting the effect of the negative pole, and exalting that of the positive in proportion to its quantity, until it overcomes and even reverses it. That sodium is actually present in these cases the author shows by the following experiment:—Having detached the negative wire, he touched the mercury, now lying quiet in the liquid, with a platinum or copper wire, and a violent action instantly began. The mercury rushed to the wire in a superficial current, and it gave off abundance of hydrogen; the sodium, wire, and liquid, forming a voltaic combination sufficiently powerful to decompose the water.

The author next proceeds to investigate more minutely the effects of different metals in their contact and amalgamation with mercury, employing solutions of the caustic alkalies for the conducting liquids, which have the advantage of producing no currents in pure mercury so long as neither pole is in contact with it. In liquid potash a contact with the negative pole, of a single second's continuance, imparted to 100 grains of mercury the property of rotating violently from the positive to the negative pole, when the circuit was completed in the liquid alone. The rotation was even sensible when the quantity of potassium did not probably exceed a millionth part of the whole mass. With sodium similar effects were observed; and even where the proportion of sodium to mercury was only as 1 to 1,600,000, a feeble motion was sensible.

The influence of barium, strontium, calcium and magnesium, and of zinc, lead, tin and iron, is next described, the alloys of these metals being all possessed of the positive property. Copper, on the other hand, does not communicate motion, though present in considerable proportion; nor do bismuth, silver, nor gold.

Mr. Herschel concludes this lecture with some general and theoretical observations and deductions, founded on his experimental inquiries. These relate principally to the exceedingly minute proportions of extraneous matter capable of communicating sensible mechanical motions, and properties of a definite character, to the body they are mixed with. When we see energies so intense exerted by the ordinary forms of matter, we may, says the author, reasonably ask what evidence we have for the imponderability of any of the powerful agents to which so large a part of the activity of material bodies seems to be owing.

Among the essential conditions of the phenomena, the author particularly adverts to the vast difference of conducting power between the metallic bodies set in motion, and the liquid under which they are immersed; to the necessity of the perfect immiscibility of the conducting fluids, so as to render the transition of one to the other quite sudden; and to a certain chemical or electrical relation between

them. Under these conditions, Mr. Herschel observes, the phenomenon may admit of explanation, from what we already know of the passage of electricity through conductors, and the high attractive and repulsive powers of the two electricities *inter se*. A body so highly positive as potassium, present in the mercury, may, for instance, have its natural electrical state exalted by its vicinity to the positive pole; and being thus repelled, may take the only course the resistance of the metal on the one hand, and attraction of cohesion on the other, will permit, viz. along the surface, to recede from the positive pole; it may even act as a carrier to the positive electricity, which may adhere to it too strongly to be transmitted through the mercury, and when arrived at the opposite side of the globule may there, by the influence of the opposite pole, lose its exalted electrical state. Such an explanation, however, is not without its difficulties; and although another is open to us, that of considering the action which takes place at the common surface of two unequally conducting media as dependent upon a new power of the electric current, bearing some analogy to magnetic action, yet this, in the present state of the investigation, must be regarded not only as a bold, but vague hypothesis.

Experiments and Observations on the Development of Magnetical Properties in Steel and Iron by Percussion:—Part II. By William Scoresby, *Jun. F.R.S.E. &c. Communicated by Sir* Humphry Davy, *Bart. Pres. R.S.* Read January 29, 1824. [*Phil. Trans.* 1824, *p.* 197.]

After adverting to the general results of his former inquiries, the author observes that his principal objects on the present occasion were to endeavour, by auxiliary rods of iron, to increase the degree of magnetism; and to ascertain on what circumstances, as to the magnitude of the iron rods, and the quality, size, and temper of the steel wires, the utmost success of the method depends.

He formerly used a single iron rod, upon which the steel bars were hammered, both being in a vertical position. He now places the steel wire between two rods of iron, and subjecting it, through the medium of the upper rod, to percussion, derives the advantage of the magnetism of both rods of iron acting at the same time upon both its poles. The rods he used were of the respective lengths of three and one foot, and an inch diameter; and the upper end of the larger rod and the lower one of the smaller rod were made conical, there being an indentation in each to receive the ends of the steel wire. Some magnetism was then elicited by percussion in the larger rod, and the steel wire being properly placed between its upper extremity and the lower one of the small rod, the upper end of the latter was hammered, and magnetism thus communicated to the wire; whilst the lower rod, receiving some influence from the percussion, performed a similar office. The author calls this mode of proceeding, the *com-*